USER GUIDE AND SPECIFICATIONS

NI USB-9219

4-Channel, 24-Bit, Universal Analog Input Module

このドキュメントの日本語版については、ni.com/manuals を参照してください。(For a Japanese language version, go to ni.com/manuals.)

This user guide describes how to use the National Instruments USB-9219 and lists the device specifications.

Introduction

The NI USB-9219 provides a USB interface for four channels of universal analog input with integrated signal conditioning. The NI USB-9219 consists of two components: an NI 9219 module, and an NI USB-9162 carrier, as shown in Figure 1.

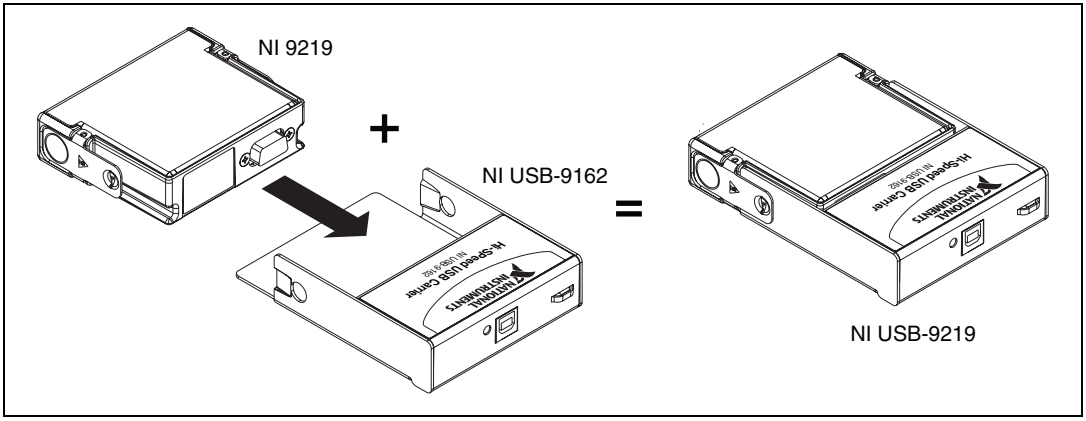


Figure 1. NI USB-9219 Components

Dimensions

Figure 2 shows the NI USB-9219 device dimensions.

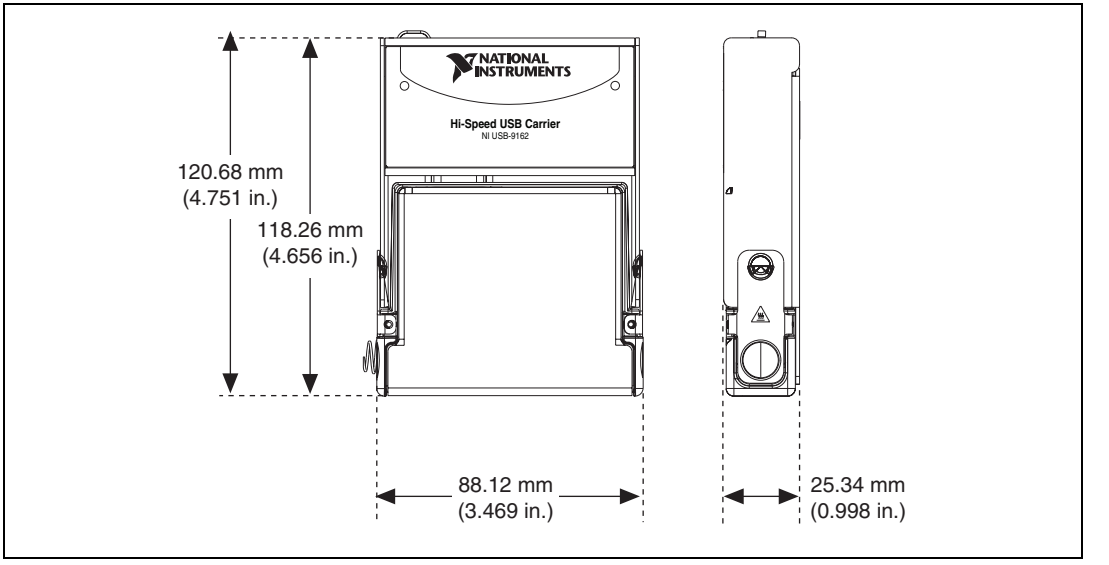


Figure 2. NI USB-9219 Device in Millimeters (Inches)

Safety Guidelines

Operate the NI USB-9219 only as described in these operating instructions.

Hot Surface This icon denotes that the component may be hot. Touching this component may result in bodily injury.

Safety Guidelines for Hazardous Voltages

If hazardous voltages are connected to the module, take the following precautions. A hazardous voltage is a voltage greater than 42.4 V_{pk} or 60 VDC to earth ground.

Caution Ensure that hazardous voltage wiring is performed only by qualified personnel adhering to local electrical standards.

Caution Do *not* mix hazardous voltage circuits and human-accessible circuits on the same module.

Caution Make sure that devices and circuits connected to the module are properly insulated from human contact.

Caution When module terminals are hazardous voltage LIVE (>42.4 V_{pk}/60 VDC), you must ensure that devices and circuits connected to the module are properly insulated from human contact. You must use the NI 9972 connector backshell kit, as illustrated in Figure 3 to ensure that the terminals are *not* accessible.

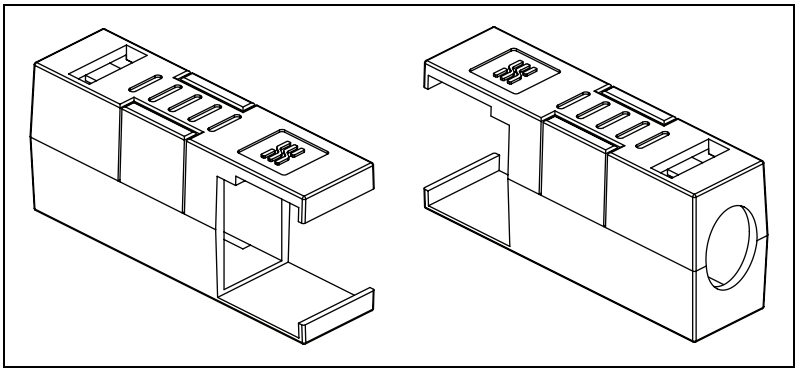


Figure 3. NI 9972 Connector Backshell

Related Documentation

Each application software package and driver includes information about writing applications for taking measurements and controlling measurement devices. The following references to documents assume you have NI-DAQmx 8.7 or later, and where applicable, version 7.1 or later of the NI application software.

NI-DAQmx for Windows

The *DAQ Getting Started Guide* describes how to install your NI-DAQmx for Windows software, your NI-DAQmx-supported DAQ device, and how to confirm that your device is operating properly. Select **Start»All Programs»National Instruments»NI-DAQ»DAQ Getting Started Guide**.

The *NI-DAQ Readme* lists which devices are supported by this version of NI-DAQ. Select **Start»All Programs»National Instruments»NI-DAQ»NI-DAQ Readme**.

The *NI-DAQmx Help* contains general information about measurement concepts, key NI-DAQmx concepts, and common applications that are applicable to all programming environments. Select **Start»All Programs»National Instruments»NI-DAQ»NI-DAQmx Help**.

LabVIEW

If you are a new user, use the *Getting Started with LabVIEW* manual to familiarize yourself with the LabVIEW graphical programming environment and the basic LabVIEW features you use to build data acquisition and instrument control applications. Open the *Getting Started with LabVIEW* manual by selecting **Start»All Programs»National Instruments»LabVIEW»LabVIEW Manuals** or by navigating to the `labview\manuals` directory and opening `LV_Getting_Started.pdf`.

Use the *LabVIEW Help*, available by selecting **Help»Search the LabVIEW Help** in LabVIEW, to access information about LabVIEW programming concepts, step-by-step instructions for using LabVIEW, and reference information about LabVIEW VIs, functions, palettes, menus, and tools. Refer to the following locations on the Contents tab of the *LabVIEW Help* for information about NI-DAQmx:

- **Getting Started»Getting Started with DAQ**—Includes overview information and a tutorial to learn how to take an NI-DAQmx measurement in LabVIEW using the DAQ Assistant.
- **VI and Function Reference»Measurement I/O VIs and Functions**—Describes the LabVIEW NI-DAQmx VIs and properties.
- **Taking Measurements**—Contains the conceptual and how-to information you need to acquire and analyze measurement data in LabVIEW, including common measurements, measurement fundamentals, NI-DAQmx key concepts, and device considerations.

LabWindows/CVI

The **Data Acquisition** book of the L*abWindows/CVI Help* contains measurement concepts for NI-DAQmx. This book also contains *Taking an NI-DAQmx Measurement in LabWindows/CVI*, which includes step-by-step instructions about creating a measurement task using the DAQ Assistant. In LabWindows™/CVI™, select **Help»Contents**, then select **Using LabWindows/CVI»Data Acquisition**.

The **NI-DAQmx Library** book of the *LabWindows/CVI Help* contains API overviews and function reference for NI-DAQmx. Select **Library Reference»NI-DAQmx Library** in the *LabWindows/CVI Help*.

Measurement Studio

If you program your NI-DAQmx-supported device in Measurement Studio using Visual C++, Visual C#, or Visual Basic .NET, you can interactively create channels and tasks by launching the DAQ Assistant from MAX or from within Visual Studio .NET. You can generate the configuration code based on your task or channel in Measurement Studio. Refer to the *DAQ Assistant Help* for additional information about generating code. You also

can create channels and tasks, and write your own applications in your ADE using the NI-DAQmx API.

For help with NI-DAQmx methods and properties, refer to the NI-DAQmx .NET Class Library or the NI-DAQmx Visual C++ Class Library included in the *NI Measurement Studio Help*. For general help with programming in Measurement Studio, refer to the *NI Measurement Studio Help*, which is fully integrated with the Microsoft Visual Studio .NET help. To view this help file in Visual Studio. NET, select **Measurement Studio» NI Measurement Studio Help**.

To create an application in Visual C++, Visual C#, or Visual Basic .NET, follow these general steps:

1. In Visual Studio .NET, select **File»New»Project** to launch the New Project dialog box.
2. Find the Measurement Studio folder for the language you want to create a program in.
3. Choose a project type. You add DAQ tasks as a part of this step.

ANSI C without NI Application Software

The *NI-DAQmx Help* contains API overviews and general information about measurement concepts. Select **Start»All Programs»National Instruments»NI-DAQ»NI-DAQmx Help**.

The *NI-DAQmx C Reference Help* describes the NI-DAQmx Library functions, which you can use with National Instruments data acquisition devices to develop instrumentation, acquisition, and control applications. Select **Start»All Programs»National Instruments»NI-DAQ» NI-DAQmx C Reference Help**.

.NET Languages without NI Application Software

With the Microsoft .NET Framework version 1.1 or later, you can use NI-DAQmx to create applications using Visual C# and Visual Basic .NET without Measurement Studio. You need Microsoft Visual Studio .NET 2003 or Microsoft Visual Studio 2005 for the API documentation to be installed.

The installed documentation contains the NI-DAQmx API overview, measurement tasks and concepts, and function reference. This help is fully integrated into the Visual Studio .NET documentation. To view the NI-DAQmx .NET documentation, go to **Start»Programs»National Instruments»NI-DAQ»NI-DAQmx .NET Reference Help**. Expand **NI Measurement Studio Help»NI Measurement Studio .NET Class Library»Reference** to view the function reference. Expand **NI Measurement Studio Help»NI Measurement Studio .NET Class**

Library»Using the Measurement Studio .NET Class Libraries to view conceptual topics for using NI-DAQmx with Visual C# and Visual Basic .NET.

To get to the same help topics from within Visual Studio, go to **Help» Contents**. Select **Measurement Studio** from the **Filtered By** drop-down list and follow the previous instructions.

Device Documentation and Specifications

NI-DAQmx includes the Device Document Browser, which contains online documentation for supported DAQ, SCXI, and switch devices, such as help files describing device pinouts, features, and operation, and PDF files of the printed device documents. You can find, view, and/or print the documents for each device using the Device Document Browser at any time by inserting the CD. After installing the Device Document Browser, device documents are accessible from **Start»All Programs»National Instruments»NI-DAQ»Browse Device Documentation**.

Note You can also download these documents at `ni.com/manuals`.

Training Courses

If you need more help getting started developing an application with NI products, NI offers training courses. To enroll in a course or obtain a detailed course outline, refer to `ni.com/training`.

Technical Support on the Web

For additional support, refer to `ni.com/support` or `zone.ni.com`.

Installing the Software

Software support for the NI USB-9219 for Vista/XP/2000 is provided by NI-DAQmx. The *DAQ Getting Started Guide*, which you can download at `ni.com/manuals`, offers NI-DAQmx users step-by-step instructions for installing software and hardware, configuring channels and tasks, and getting started developing an application.

Installing Other Software

If you are using other software, refer to the installation instructions that accompany your software.

Example Programs

The NI-DAQmx CD contains example programs that you can use to get started programming with the NI USB-9219. Refer to the *NI-DAQmx for USB Devices Getting Started Guide* that shipped with your device, and is also accessible from **Start»All Programs»National Instruments» NI-DAQ**, for more information.

Installing the NI USB-9219 Device

Before installing the device, you must install the software you plan to use with the device. Refer to the *Installing the Software* section of this guide and the documentation included with the software for more information.

Installing the NI USB-9219 Device into the NI USB-9162 Carrier

The NI USB-9219 module and NI USB-9162 carrier are packaged separately. Refer to Figure 4, while completing the following assembly steps:

1. Make sure that no signals are connected to the NI USB-9219 module and the USB cable is not connected to the device.
2. Remove the protective cover from the 15-pin D-SUB connector.
3. Align the I/O module with the carrier, as shown in Figure 4.

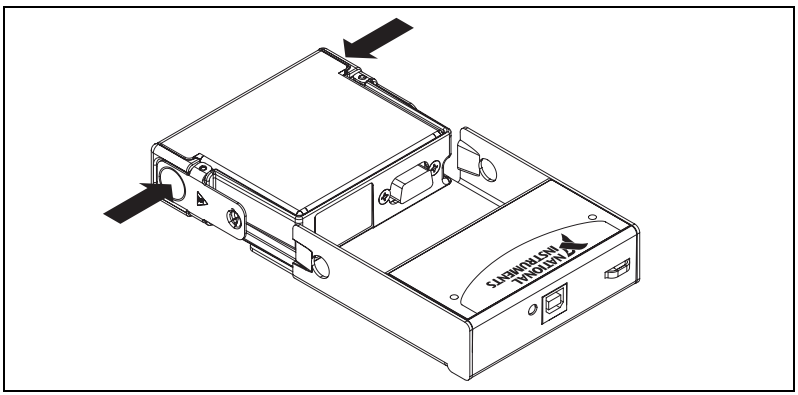


Figure 4. Module Installation

4. Squeeze the latches and insert the NI USB-9219 module into the NI USB-9162 carrier.

5. Press firmly on the connector side of the NI USB-9219 module until the latches lock the module into place, as shown in Figure 5.

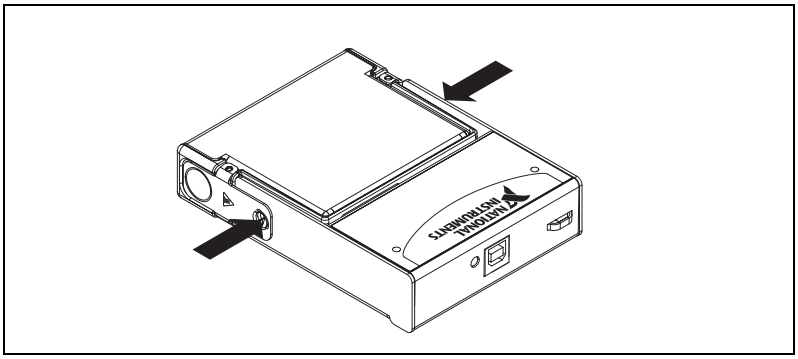


Figure 5. Locking Module into Place

6. Connect the USB cable to the assembled NI USB-9219.

Mounting the NI USB-9219 to a Panel

Threaded inserts are located in the NI USB-9219 for mounting it to a panel. Refer to Figure 6 for dimensions.

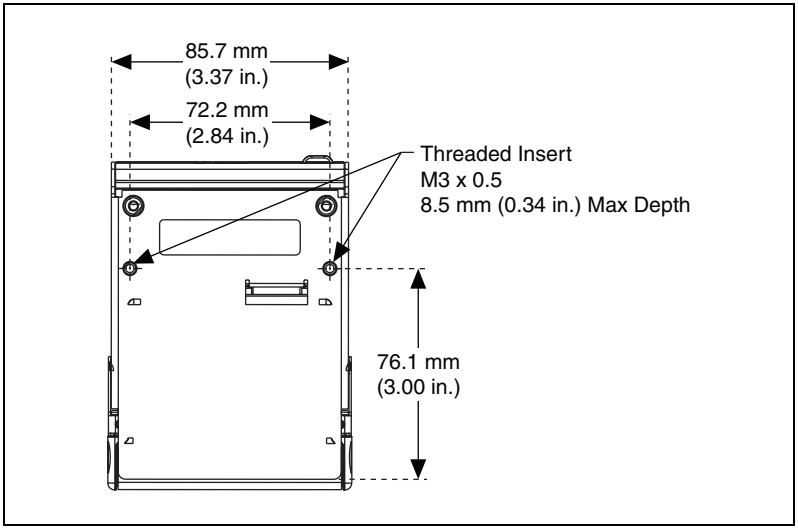


Figure 6. Module Dimensions In Millimeters (Inches)

Connecting the NI USB-9219 to a Computer

Plug one end of the USB cable into the NI USB-9219 and the other end into an available USB port on the computer. Refer to the *NI-DAQmx for USB Devices Getting Started Guide* that shipped with your device, and is also accessible from **Start»All Programs»National Instruments»NI-DAQ**, for more information.

LED Indicator

The NI USB-9219 device has a green LED next to the USB connector. The LED indicator indicates device status, as listed in Table 1. When the device is connected to a USB port, the LED blinks steadily to indicate that the device is initialized and is receiving power from the connection.

If the LED is not blinking, it may mean that the device is not initialized or the computer is in standby mode. In order for the device to be recognized, the device must be connected to a computer that has NI-DAQmx installed on it. If your device is not blinking, make sure your computer has the latest version of NI-DAQmx installed on it, and the computer is not in standby mode.

Table 1. LED State/Device Status

LED State	Device Status
Not lit	Device not connected or in suspend.
On, not blinking	Device connected, but no module installed.
Single-blink	Operating normally.
Double-blink	Operating normally.
Quadruple-blink	Device error. Refer to `ni.com/support`.

Wiring the NI USB-9219 Device

Caution A high voltage screw terminal backshell must be installed when using hazardous voltages (>42.4 V_{pk}, 60 VDC).

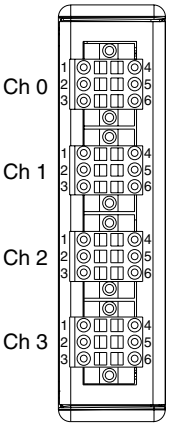
Note Table 2 illustrates the accessories available from `ni.com` for use with the NI USB-9219.

Table 2. Accessories

Accessory	Accessory Description
NI 9972	Strain relief for 6-position spring terminal
NI 9973	6-position connectors

The NI USB-9219 has four 6-terminal connectors that provide connections for four analog input channels. Connect the positive signal of the signal source to the positive input signal terminal (HI) and the negative signal of the signal source to the negative input signal terminal (LO). Use the excitation terminals if your sensor requires a separate excitation connection. Refer to Table 3 for the signal names and Table 4 for the terminal assignments for each mode. Refer to the *NI USB-9219 Circuitry* section for information about connections in each mode.

Table 3. Signal Names

Module	Terminal	Signal Name	Signal Description
	1	T+	TEDS Data
	2	T–	TEDS COM
	3	EX+/HI*	Positive excitation or input signal
	4	HI	Positive input signal
	5	EX–/LO*	Negative excitation or input signal
	6	LO	Negative input signal

* Depending on the mode, terminals 3 and 5 are either the excitation signals or the input signals.

Table 4. Terminal Assignments

Mode	Terminal					
	1	2	3	4	5	6
Voltage	T+	T–	—	HI	LO	—
Current	T+	T–	HI	—	LO	—
4-Wire Resistance	T+	T–	EX+	HI	EX–	LO
2-Wire Resistance	T+	T–	HI	—	LO	—
Thermocouple	T+	T–	—	HI	LO	—
4-Wire RTD	T+	T–	EX+	HI	EX–	LO
3-Wire RTD	T+	T–	EX+	—	EX–	LO
Quarter-Bridge	T+	T–	HI	—	LO	—
Half-Bridge	T+	T–	EX+	HI	EX–	—
Full-Bridge	T+	T–	EX+	HI	EX–	LO
Digital In	T+	T–	—	HI	LO	—
Open Contact	T+	T–	HI	—	LO	—

Connecting Wires to the NI USB-9219 Connectors

Use a flathead screwdriver with a blade smaller than 2.3 × 1.0 mm (0.09 × 0.04 in.) to connect wires to the detachable spring-terminal connectors. Insert the screwdriver into a spring clamp activation slot and press a wire into the corresponding connector terminal, then remove the screwdriver to clamp the wire into the terminal. Refer to the *Specifications* section for more information about spring-terminal wiring. Refer to Figure 7 for an illustration of connecting wires to the NI USB-9219.

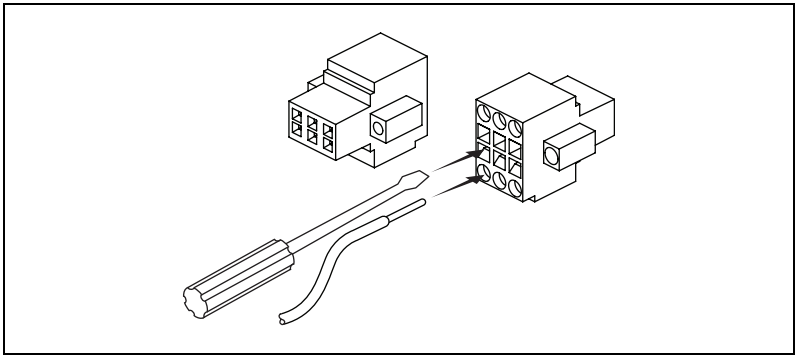


Figure 7. Connecting Wires to the NI USB-9219 Connectors

Wiring TEDS Channels

The NI USB-9219 supports only Class II TEDS sensors. Connect the two TEDS lines to TEDS Data (T+) and TEDS COM (T–) and ensure that neither T+ nor T– is tied in common to any of the signal inputs (terminals 3 through 6) on the NI USB-9219. Visit `ni.com/info` and enter the info code `rdteds` for information about TEDS sensors.

Grounding and Shielding Considerations

You can connect ground-referenced or floating signal sources to the NI USB-9219. If you make a floating connection between the signal source and the NI USB-9219, make sure the voltages on the positive and negative connections are within the channel-to-earth working voltage range to ensure proper operation of the NI USB-9219. Refer to the *Specifications* section for more information about operating voltages and overvoltage protection.

Note For best signal quality, National Instruments recommends using shielded cables and twisted-pair wiring whenever possible.

Figures 8 and 9 illustrate connecting grounded and floating signal sources to the NI USB-9219 in Voltage mode.

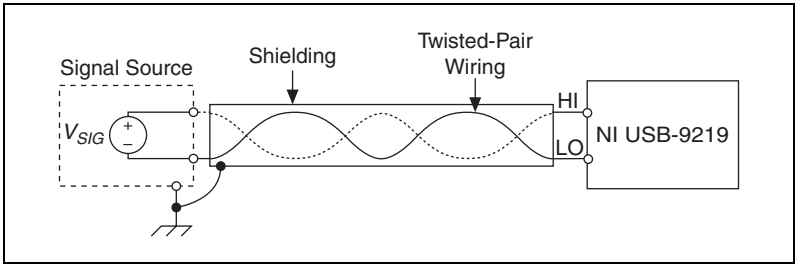


Figure 8. Connecting a Grounded Signal Source to the NI USB-9219

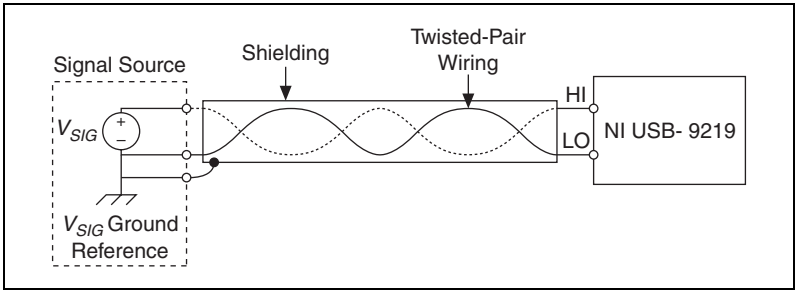


Figure 9. Connecting a Floating Signal Source to the NI USB-9219

NI USB-9219 Timing Options

The NI USB-9219 supports four different timing options that are optimized for different types of applications by using different ADC conversion times. High Speed is optimized for high speed at the expense of noise rejection, Best 60 Hz Rejection is optimized for rejection of 60 Hz noise, Best 50 Hz Rejection is optimized for rejection of 50 Hz noise, and High Resolution is optimized for maximum overall noise rejection and provides good rejection of 50 Hz and 60 Hz noise. Refer to the *Specifications* section for more information.

NI USB-9219 Circuitry

The NI USB-9219 is channel-to-channel isolated. Four 24-bit analog-to-digital converters (ADCs) simultaneously sample all four analog input channels. An excitation circuit is enabled for all input modes that require excitation. The ADC and excitation circuits are reconfigured in each mode to accommodate each type of sensor. Refer to Figure 10 for an illustration of the input circuitry for one channel of the NI USB-9219.

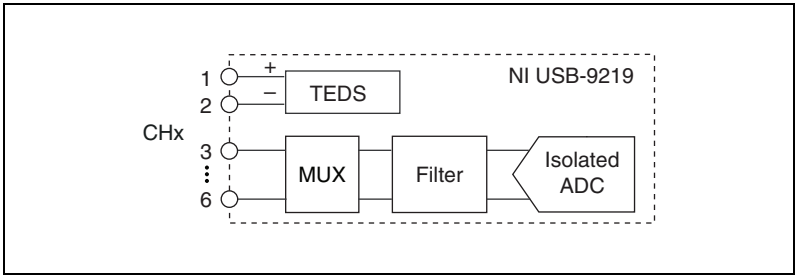


Figure 10. Input Circuitry for One Channel

Voltage and Current Modes

In Voltage and Current modes, connect the signal source to the NI USB-9219 across the HI and LO terminals. The current is computed from the voltage that the ADC measures across an internal shunt resistor. Refer to Figure 11 for an illustration of the connections.

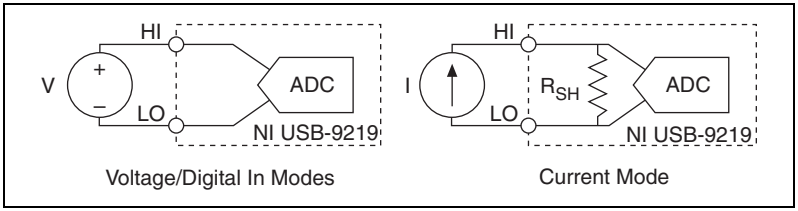


Figure 11. Connections in Voltage, Current, and Digital In Modes

4-Wire Resistance and 4-Wire RTD Modes

4-Wire Resistance and 4-Wire RTD modes source a current, which varies based on the resistance of the load, between the EX+ and EX– terminals. The measured resistance is computed from the resulting voltage reading. These modes are not affected by lead wire resistance because a negligible amount of current flows across the HI and LO terminals due to the high input impedance of the ADC. Refer to Figure 12 for an illustration of the connections.

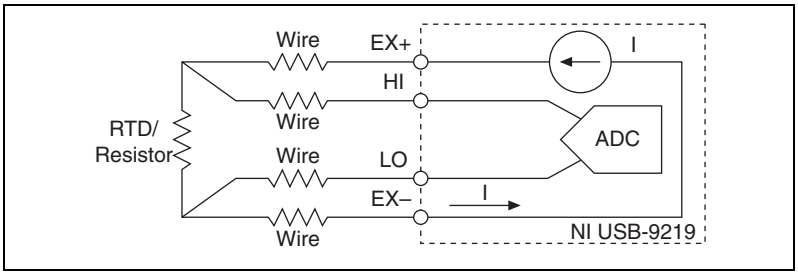


Figure 12. Connections in 4-Wire Resistance and 4-Wire RTD Modes

3-Wire RTD Mode

3-Wire RTD mode sources a current, which varies based on the resistance of the load, between the EX+ and EX– terminals. This mode compensates for lead wire resistance in hardware if all the lead wires have the same resistance. A gain of 2x is applied to the voltage across the negative lead wire and the ADC uses this voltage as the negative reference to cancel the resistance error across the positive lead wire. Refer to Figure 13 for an illustration of the connections.

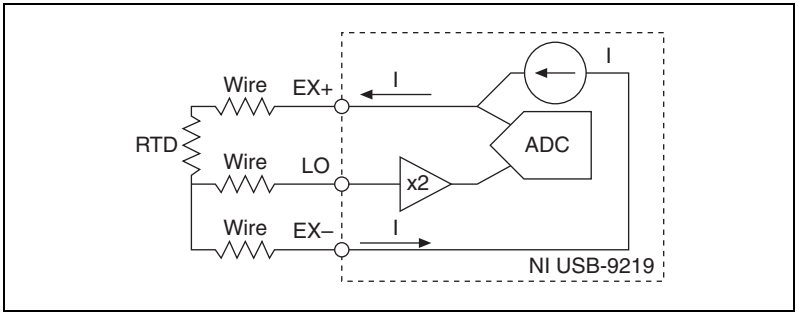


Figure 13. Connections in 3-Wire RTD Mode

2-Wire Resistance and Quarter-Bridge Modes

In 2-Wire Resistance and Quarter-Bridge modes, connect the two ends of the resistor or gauge to the NI USB-9219 across the HI and LO terminals. These modes source a current, which varies based on the resistance of the load, between the HI and LO terminals. The resulting resistance is computed from the voltage measurement. 2-Wire Resistance and Quarter-Bridge modes do not compensate for lead wire resistance. Refer to Figure 14 for an illustration of the connections.

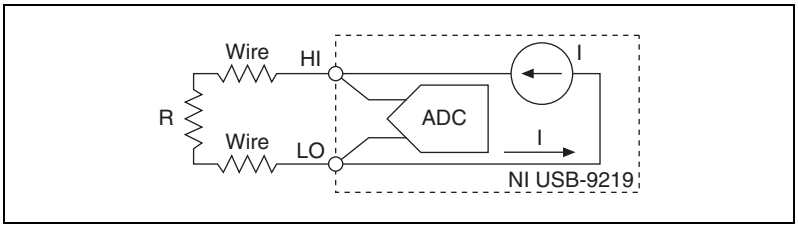
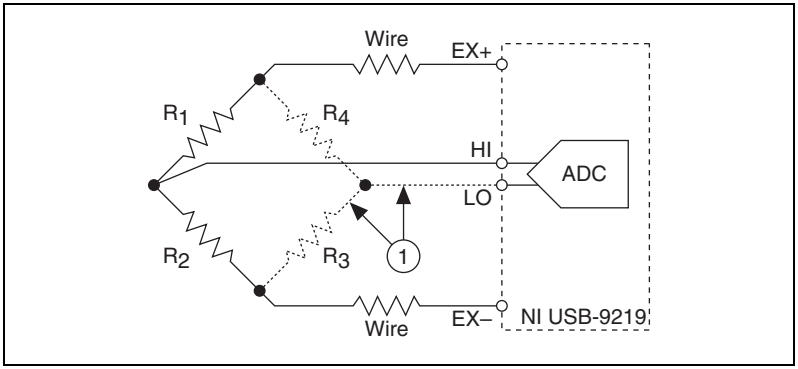


Figure 14. Connections in 2-Wire Resistance and Quarter-Bridge Modes

Half-Bridge and Full-Bridge Modes

Half-Bridge and Full-Bridge modes use the internal voltage excitation to set the input range of the ADC and return voltage readings that are proportional to the excitation level. The internal excitation voltage is nominally 2.5 V but it varies based on the resistance of the sensor. Refer to the *Specifications* section for more information about excitation levels.

In Half-Bridge mode, the HI input is referenced to EX–. In Full-Bridge mode, the ADC reads the HI and LO inputs differentially. Refer to Figure 15 for an illustration of the connections.



1 The dotted line represents the portion of the circuit that is connected only in Full-Bridge mode.

Figure 15. Connections in Half-Bridge and Full-Bridge Modes

Thermocouple Mode

In Thermocouple mode, connect the positive end of the thermocouple to HI and the negative end of the thermocouple to LO. This mode uses the ±125 mV range of the ADC to return a voltage reading. Use shielded cables and twisted-pair wiring and ground the shielded cables. Each channel has a built-in thermistor for cold-junction compensation (CJC) calculations. For improved CJC sensor accuracy, operate the NI USB-9219 in a stable temperature environment and avoid placing heat sources near the module or its connectors. Refer to the *Specifications* section for more information about accuracy. The NI USB-9219 does not support open thermocouple detection. Refer to Figure 16 for an illustration of the connections.

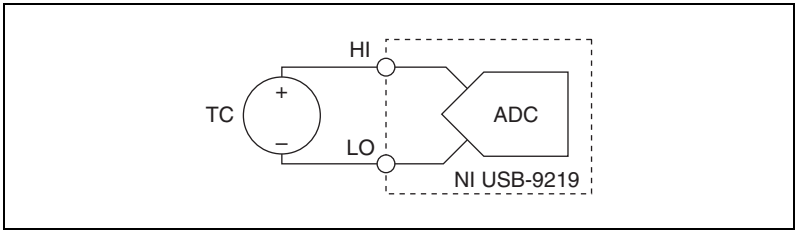


Figure 16. Connections in Thermocouple Mode

Excitation Protection

The NI USB-9219 excitation circuit is protected from overcurrent and overvoltage fault conditions. The circuit is automatically disabled in the event of a fault condition. Whenever possible, channels automatically recover after the fault is removed. Refer to the software documentation for information on how an excitation fault is displayed and handled.

Specifications

The following specifications are typical for the range 0 to 60 °C unless otherwise noted.

Input Characteristics

Number of channels ..... 4 analog input channels

ADC resolution ..... 24 bits

Type of ADC..... Delta-sigma (with analog prefiltering)

Sampling mode ..... Simultaneous

Type of TEDS supported ..... IEEE 1451.4 TEDS Class II (Interface)

Mode input ranges

Mode	Nominal Range(s)	Actual Range(s)
Voltage	±60 V, ±15 V, ±4 V, ±1 V, ±125 mV	±60 V, ±15 V, ±4 V, ±1 V, ±125 mV
Current	±25 mA	±25 mA
4-Wire and 2-Wire Resistance	10 kΩ, 1 kΩ	10.5 kΩ, 1.05 kΩ
Thermocouple	±125 mV	±125 mV
4-Wire and 3-Wire RTD	Pt 1,000, Pt 100	5.05 kΩ, 505 Ω
Quarter-Bridge	350 Ω, 120 Ω	390 Ω, 150 Ω
Half-Bridge	±500 mV/V	±500 mV/V
Full-Bridge	±62.5 mV/V, ±7.8 mV/V	±62.5 mV/V, ±7.8125 mV/V

Conversion time, no channels in TC mode

- High Speed..... 10 ms for all channels
- Best 60 Hz Rejection ..... 110 ms for all channels
- Best 50 Hz Rejection ..... 130 ms for all channels
- High Resolution ..... 500 ms for all channels

Conversion time, one or more channels in TC mode

- High Speed..... 20 ms for all channels
- Best 60 Hz Rejection ..... 120 ms for all channels
- Best 50 Hz Rejection ..... 140 ms for all channels
- High Resolution ..... 510 ms for all channels

Overvoltage protection

Terminals 1 and 2 .....±30 V

Terminals 3 through 6,
across any combination .....±60 V

Input impedance

Voltage and Digital In modes
(±60 V, ±15 V, ±4 V) .....1 MΩ

Current mode .....< 40 Ω

All other modes .....>1 GΩ

Accuracy

Mode, Range	Gain Error (% of Reading)†	Offset Error (ppm of Range)†
Voltage, ±60 V	±0.3, ±0.4	±20, ±50
Voltage, ±15 V	±0.3, ±0.4	±60, ±180
Voltage, ±4 V	±0.3, ±0.4	±240, ±720
Voltage, ±1 V	±0.1, ±0.18	±15, ±45
Voltage/Thermocouple, ±125 mV	±0.1, ±0.18	±120, ±360
Current, ±25 mA	±0.1, ±0.6	±30, ±100
4-Wire and 2-Wire* Resistance, 10 kΩ	±0.1, ±0.5	±120, ±320
4-Wire and 2-Wire* Resistance, 1 kΩ	±0.1, ±0.5	±1,200, ±3,200
4-Wire and 3-Wire RTD, Pt 1,000	±0.1, ±0.5	±240, ±640
4-Wire and 3-Wire RTD, Pt 100	±0.1, ±0.5	±2,400, ±6,400
Quarter-Bridge, 350 Ω	±0.1, ±0.5	±2,400, ±6,400
Quarter-Bridge, 120 Ω	±0.1, ±0.5	±2,400, ±6,400
Half-Bridge, ±500 mV/V	±0.03, ±0.07	±300, ±450
Full-Bridge, ±62.5 mV/V	±0.03, ±0.08	±300, ±1,000
Full-Bridge, ±7.8 mV/V	±0.03, ±0.08	±2,200, ±8,000

* 2-Wire Resistance mode accuracy depends on the lead wire resistance. This table assumes 0 Ω of lead wire resistance.
† Typ (25 °C, ±5 °C), Max (–40 to 70 °C)

Cold-junction compensation
sensor accuracy .....±1°C typ

Stability

Mode, Range	Gain Drift (ppm of Reading/°C)	Offset Drift (ppm of Range/°C)
Voltage, ±60 V	±20	±0.2
Voltage, ±15 V	±20	±0.8
Voltage, ±4 V	±20	±3.2
Voltage, ±1 V	±10	±0.2
Voltage/Thermocouple, ±125 mV	±10	±1.6
Current, ±25 mA	±15	±0.4
4-Wire and 2-Wire Resistance, 10 kΩ	±15	±3
4-Wire and 2-Wire Resistance, 1 kΩ	±15	±30
4-Wire and 3-Wire RTD, Pt 1,000	±15	±6
4-Wire and 3-Wire RTD, Pt 100	±15	±60
Quarter-Bridge, 350 Ω	±15	±120
Quarter-Bridge, 120 Ω	±15	±240
Half-Bridge, ±500 mV/V	±3	±20
Full-Bridge, ±62.5 mV/V	±3	±20
Full-Bridge, ±7.8 mV/V	±3	±20

Input noise in ppm of $Range_{rms}$

Mode, Range	Conversion Time			
	High Speed	Best 60 Hz Rejection	Best 50 Hz Rejection	High Resolution
Voltage, ±60 V	7.6	1.3	1.3	0.5
Voltage, ±15 V	10.8	1.9	1.9	0.7
Voltage, ±4 V	10.8	2.7	2.7	1.3
Voltage, ±1 V	7.6	1.3	1.3	0.5
Voltage/Thermocouple, 125 mV	10.8	1.9	1.9	1.0
Current, ±25 mA	10.8	1.9	1.9	1.0
4-Wire and 2-Wire Resistance, 10 kΩ	4.1	1.3	0.8	0.3
4-Wire and 2-Wire Resistance, 1 kΩ	7.1	1.8	1.2	0.7
4-Wire and 3-Wire RTD, Pt 1,000	7.6	1.7	1.1	0.4
4-Wire and 3-Wire RTD, Pt 100	10.8	1.9	1.9	0.9
Quarter-Bridge, 350 Ω	5.4	1.0	1.0	0.7
Quarter-Bridge, 120 Ω	5.4	1.0	1.0	0.7
Half-Bridge, ±500 mV/V	3.8	0.5	0.5	0.2
Full-Bridge, ±62.5 mV/V	5.4	1.0	1.0	0.8
Full-Bridge, ±7.8 mV/V	30	4.7	4.7	2.3

Input bias current.....<1 nA

INL.....±15 ppm

CMRR (f_{in} = 60 Hz).....>100 dB

NMRR

Best 60 Hz Rejection.....90 dB at 60 Hz

Best 50 Hz Rejection.....80 dB at 50 Hz

High Resolution.....65 dB at 50 Hz and 60 Hz

Excitation level for Half-Bridge and Full-Bridge modes

Mode	Load Resistance (Ω)	Excitation (V)
Half-Bridge	700	2.5
Half-Bridge	240	2.0
Full-Bridge	350	2.7
Full-Bridge	120	2.2

Excitation level for Resistance, RTD, and Quarter-Bridge modes

Load Resistance (Ω)	Excitation (mV)
120	50
350	150
1,000	430
10,000	2,200

Power Requirements

Current consumption from USB ..... 500 mA, max

Suspend mode ..... 2.5 MA, max

Bus Interface

USB specification ..... USB 2.0 Hi-Speed

Physical Characteristics

Spring-terminal wiring ..... 18 to 28 AWG copper conductor wire with 7 mm (0.28 in.) of insulation stripped from the end

Weight ..... 258 g (9.1 oz)

If you need to clean the module, wipe it with a dry towel.

Safety Voltages

Connect only voltages that are within these limits.

Isolation

Channel-to-channel

Continuous .....250 VAC, Measurement Category II

Withstand .....1390 VAC, verified by a 5 s dielectric withstand test

Channel-to-earth ground

Continuous .....250 VAC, Measurement Category II

Withstand .....2300 VAC, verified by a 5 s dielectric withstand test

Measurement Category II is for measurements performed on circuits directly connected to the electrical distribution system. This category refers to local-level electrical distribution, such as that provided by a standard wall outlet, for example, 115 V for U.S. or 230 V for Europe. Do *not* connect the NI 9219 to signals or use for measurements within Measurement Categories III or IV.

Safety Standards

This product is designed to meet the requirements of the following standards of safety for electrical equipment for measurement, control, and laboratory use:

- IEC 61010-1, EN 61010-1
- UL 61010-1, CSA 61010-1

Note For UL and other safety certifications, refer to the product label or visit `ni.com/certification`, search by module number or product line, and click the appropriate link in the Certification column.

Hazardous Locations

The USB-9219 is not certified for use in hazardous locations.

Environmental

The USB-9219 is intended for indoor use only but may be used outdoors if installed in a suitable enclosure.

Operating temperature
(IEC 60068-2-1, IEC 60068-2-2)..... 0 to 60 °C

Storage temperature
(IEC 60068-2-1, IEC 60068-2-2)..... –40 to 85 °C

Ingress protection..... IP 40

Operating humidity
(IEC 60068-2-56)..... 10 to 90% RH, noncondensing

Storage humidity
(IEC 60068-2-56)..... 5 to 95% RH, noncondensing

Maximum altitude..... 2,000 m

Pollution Degree (IEC 60664) 2

Electromagnetic Compatibility

This product is designed to meet the requirements of the following standards of EMC for electrical equipment for measurement, control, and laboratory use:

- EN 61326 EMC requirements; Industrial Immunity
- EN 55011 Emissions; Group 1, Class A
- CE, C-Tick, ICES, and FCC Part 15 Emissions; Class A

Note For EMC compliance, operate this device with shielded cabling.

CE Compliance

This product meets the essential requirements of applicable European Directives, as amended for CE marking, as follows:

- 2006/95/EC; Low-Voltage Directive (safety)
- 2004/108/EC; Electromagnetic Compatibility Directive (EMC)

Note Refer to the Declaration of Conformity (DoC) for this product for any additional regulatory compliance information. To obtain the DoC for this product, visit `ni.com/certification`, search by model number or product line, and click the appropriate link in the Certification column.

Environmental Management

National Instruments is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial not only to the environment but also to NI customers.

For additional environmental information, refer to the *NI and the Environment* Web page at `ni.com/environment`. This page contains the environmental regulations and directives with which NI complies, as well as other environmental information not included in this document.

Waste Electrical and Electronic Equipment (WEEE)



EU Customers At the end of their life cycle, all products *must* be sent to a WEEE recycling center. For more information about WEEE recycling centers and National Instruments WEEE initiatives, visit `ni.com/environment/weee.htm`.

电子信息产品污染控制管理办法 （中国 RoHS）



中国客户 National Instruments 符合中国电子信息产品中限制使用某些有害物质指令 (RoHS)。
关于 National Instruments 中国 RoHS 合规性信息，请登录 `ni.com/environment/rohs_china`。
(For information about China RoHS compliance, go to `ni.com/environment/rohs_china`.)

Calibration

You can obtain the calibration certificate and information about calibration services for the NI 9219 at `ni.com/calibration`.

Calibration interval.....1 year

Where to Go for Support

The National Instruments Web site is your complete resource for technical support. At `ni.com/support` you have access to everything from troubleshooting and application development self-help resources to email and phone assistance from NI Application Engineers.

National Instruments corporate headquarters is located at 11500 North Mopac Expressway, Austin, Texas, 78759-3504. National Instruments also has offices located around the world to help address your support needs. For telephone support in the United States, create your service request at `ni.com/support` and follow the calling instructions or dial 512 795 8248. For telephone support outside the United States, contact your local branch office:

Australia 1800 300 800, Austria 43 662 457990-0,
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Czech Republic 420 224 235 774, Denmark 45 45 76 26 00,
Finland 358 (0) 9 725 72511, France 01 57 66 24 24,
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Lebanon 961 (0) 1 33 28 28, Malaysia 1800 887710,
Mexico 01 800 010 0793, Netherlands 31 (0) 348 433 466,
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Poland 48 22 3390150, Portugal 351 210 311 210, Russia 7 495 783 6851,
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